Technical Information

Specifications for Power Macintosh 8500 series computers

Technical Information

Main unit

Power Macintosh 8500/150 processor

A PowerPC™ 604 processor with the following features:

- 150 megahertz (MHz) processor clock
- built-in floating point unit (FPU)
- 50 MHz system bus
- fully upgradeable

Power Macintosh 8500/180 processor

A PowerPC 604e processor with the following features:

- 180 MHz processor clock
- built-in FPU
- 45 MHz system bus
- fully upgradeable

Memory

- 16 megabytes (MB) of dynamic random-access memory (DRAM) supplied in removable DIMMs, expandable to a maximum of 512 MB
- 2 MB of built-in video RAM (VRAM) supplied in removable DIMMs, expandable to a maximum of 4 MB
- 4 MB of read-only memory (ROM)
- 8 kilobytes (K) of nonvolatile parameter memory
- one 256K DIMM of static RAM used as a Level 2 cache, upgradeable to 1 MB

DRAM, VRAM, and cache configurations

You can have memory—dynamic random-access memory (DRAM) or video random-access memory (VRAM)—added to your computer in packages called Dual Inline Memory Modules, or DIMMs. You can also upgrade your computer's cache by installing a DIMM.

WARNING To avoid damage to your computer, Apple Computer recommends that only an Apple-certified technician install additional DIMMs. Consult the service and support information that came with your computer for instructions on how to contact an Apple-authorized service provider or Apple for service. If you attempt to install additional DIMMs yourself, any damage you may cause to your equipment will not be covered by the limited warranty on your computer. See an Apple-authorized dealer or service provider for additional information about this or any other warranty question.

DRAM configurations

Your computer can use any DRAM configuration with DIMMs of these sizes: 8, 16, 32, or 64 MB. The exact configuration depends on the density of the DRAM chips that are mounted on the DIMMs. (The DIMMs support both 2K and 4K refresh rates.)

You can increase your computer's DRAM to up to 512 MB. The main logic board has eight slots where DIMMs can be installed. To increase DRAM to the maximum of 512 MB, have an Apple-authorized dealer or service provider fill all eight slots with 64 MB DIMMs. You can also fill slots with 8, 16, or 32 MB DIMMs.

Note: 128 MB DIMMs are available and can fit in the computer's memory slots to increase DRAM to as much as 1 gigabyte (GB). These DIMMs have not been tested for use with Power Macintosh 8500 computers, however.

IMPORTANT The DIMMs should be 64-bit-wide, 168-pin fast-paged mode, with 70-nanosecond (ns) RAM access time or faster. The Single Inline Memory Modules (SIMMs) from older Macintosh computers are not compatible with your computer and should not be used.

VRAM configurations

Video RAM (VRAM), like standard DRAM, is also provided in DIMMs. Your computer comes with 2 MB of VRAM installed in two 1 MB DIMMs. (These DIMMs are installed in bank 1.) Your computer's VRAM can be expanded to a maximum of 4 MB by adding two 1 MB DIMMs to bank 2. Both DIMMs must be added at the same time.

IMPORTANT The VRAM DIMMs must be 32-bit-wide, 112-pin fast-paged mode with 70-ns RAM access time or faster. Do not use the 256K or 512K VRAM SIMMs used in older Macintosh computers.

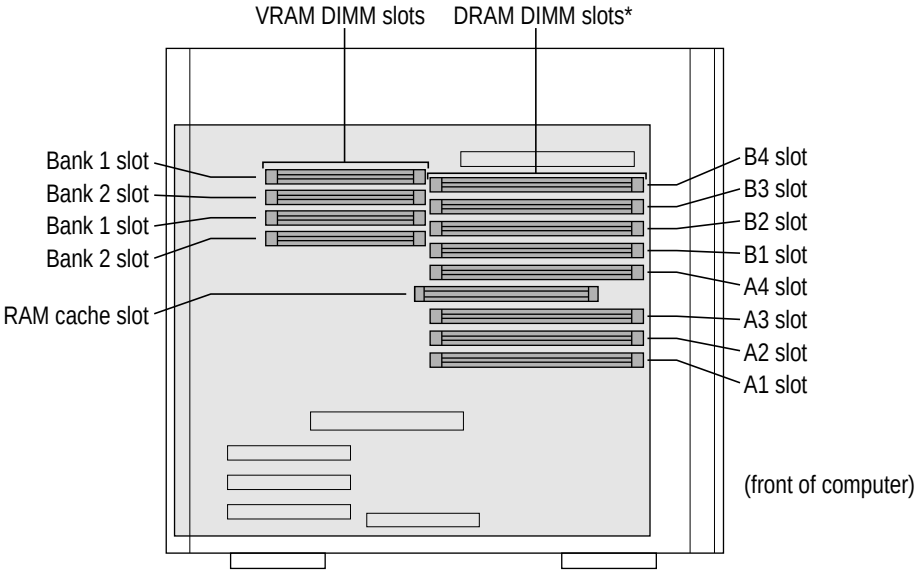
Cache configurations

Your computer's 256K cache can be upgraded to a maximum of 4 MB by installing a cache DIMM. Cache DIMMs are available in various sizes from 256K to 1 MB.

Adding DRAM

If you decide to have additional DRAM installed in your computer, the DIMMs can be installed one at a time in any order in any of the memory slots.

However, if you wish to take advantage of your computer's memory interleaving capability, which provides maximum performance, you must have the DIMMs installed in pairs and in paired slots. (Slots are paired A1 and B1, A2 and B2, and so on. It doesn't matter which pairs you use or the order in which you use them, as long as the DIMMs are installed in paired slots.) Memory interleaving allows the computer to read or write to its memory at the same time that other memory reads or writes are occurring, thus providing faster performance.



*When installing DRAM, for best performance, fill paired slots. (Slots are paired A1 and B1, then A2 and B2, and so on. It doesn't matter which pairs you use or the order in which you use them.)

Graphics modes

The table on the following page shows the image sizes for monitors that can be connected to the monitor port, along with the number of colors or grays supported with 2 MB of VRAM and with the optional expansion to 4 MB of VRAM.

There are also many special PCI monitor cards available from other manufacturers that can support other monitors and special video requirements. See your Apple-authorized dealer for information.

Note: On some monitors from manufacturers other than Apple, the connector pinout designates one pin for both green video and timing synchronization. These "sync on green" monitors are not compatible with Power Macintosh computers. If you're not sure what type of monitor you have, check with your dealer.

Colors or grays supported

Monitor	VIS*	Resolution	2 MB VRAM maximum colors**	4 MB VRAM maximum colors**	Screen refresh rates Vertical	Horizontal
12" RGB	N/A	512 by 384	Millions	Millions	60 Hz	24.48 kHz
12" Monochrome	N/A	640 by 480	256	256	67 Hz	34.971 kHz
13" RGB Hi-Res	N/A	640 by 480	Millions	Millions	67 Hz	34.971 kHz
14" RGB Hi-Res	11.5"	640 by 480	Millions	Millions	67 Hz	34.971 kHz
14" AudioVision	11.5"	640 by 480	Millions	Millions	67 Hz	35 kHz
VGA	***	640 by 480	Millions	Millions	60 Hz	31.505 kHz
		800 by 600	Millions	Millions	60 Hz	39.921 kHz
		800 by 600	Millions	Millions	72 Hz	48.1 kHz
		800 by 600	Millions	Millions	75 Hz	47.933 kHz
		1024 by 768	Thousands	Millions	60 Hz	48.294 kHz
		1024 by 768	Thousands	Millions	72 Hz	58.286 kHz
		1024 by 768	Thousands	Millions	75 Hz	60.093 kHz
Full-page Monochrome	N/A	640 by 870	256	256	75 Hz	68.773 kHz
Full-page RGB	***	640 by 870	Thousands	Millions	75 Hz	68.773 kHz
16" color	14.8"	832 by 624	Millions	Millions	75 Hz	49.670 kHz
19" color	***	1024 by 768	Thousands	Millions	75 Hz	60.060 kHz
Two-page Monochrome	N/A	1152 by 870	256	256	75 Hz	68.476 kHz
Two-page RGB	11.5"	1152 by 870	Thousands	Millions	75 Hz	68.476 kHz
Multiple Scan 15	13.3"	640 by 480	Millions	Millions	67 Hz	34.971 kHz
		832 by 624	Millions	Millions	75 Hz	49.670 kHz
Multiple Scan 17	16.1"	640 by 480	Millions	Millions	67 Hz	34.971 kHz
		832 by 624	Millions	Millions	75 Hz	49.670 kHz
		1024 by 768	Thousands	Millions	75 Hz	60.060 kHz
Multiple Scan 20	19.1"	640 by 480	Millions	Millions	67 Hz	34.971 kHz
		832 by 624	Millions	Millions	75 Hz	49.670 kHz
		1024 by 768	Thousands	Millions	75 Hz	60.060 kHz
		1152 by 870	Thousands	Millions	75 Hz	68.476 kHz
		1280 by 1024	256	Thousands	75 Hz	79.964 kHz

*Viewable Image Size

**256=image depth of 8 bits, thousands=image depth of 16 bits, millions=image depth of 32 bits.

***Refer to the manual that came with your monitor to determine VIS.

N/A=not available

Video support

All video input ports support 24-bit RGB format as well as 16-bit component (YUV) format.

Video input ports

Connector	Standard	Resolution
Composite/S-video	NTSC	256 by 192 320 by 240 512 by 384 640 by 480
Composite/S-video	PAL	320 by 240 384 by 288 640 by 480 768 by 576

Video output ports

Connector	Standard	Resolution
Composite/S-video	NTSC	640 by 480 (fullframe or overscan) 512 by 384 (safe-title or underscan)
Composite/S-video	PAL/SECAM	768 by 576 (fullframe or overscan) 640 by 480 (safe-title or underscan)

Internal disk drives

The following drives have already been installed in your computer at the factory:

- Apple SuperDrive 1.4 MB high-density floppy disk drive
- Apple SCSI hard disk drive

Some Power Macintosh computers have an optional built-in CD-ROM drive (5.25-inch, 1/2-height 8x-speed).

You can have additional internal drives installed by an Apple-authorized dealer or service provider.

Clock/calendar

- CMOS custom circuitry with long-life lithium battery

Keyboard

- Supports all Apple Desktop Bus (ADB) keyboards

Mouse

- Supports all models of the ADB mouse

Interfaces

- One Apple Desktop Bus (ADB) port supporting up to three ADB input devices (such as a trackball, keyboard, or mouse) daisy-chained through a low-speed, synchronous serial bus.
- Monitor port supporting color and grayscale monitors of various sizes and resolutions. (See “Graphics Modes” earlier in this booklet.)
- Three internal expansion slots supporting Peripheral Component Interconnect (PCI) expansion cards. Install only expansion cards that come with Macintosh drivers and are compliant with the PCI 2.0 standard. NuBus™ cards cannot be used in these expansion slots.
- Two RS-232/RS-422 serial GeoPort-compatible serial ports, 230.4 Kbits per second maximum (up to 2.048 Mbits per second if clocked externally).
- One built-in Ethernet 10BASE-T port for direct connection to 10BASE-T networks. (If both AAUI and 10BASE-T connectors are plugged in, the computer uses the 10BASE-T connector by default.)
- One built-in Apple Ethernet AAUI port for connecting to high-speed Ethernet networks. Requires the appropriate AAUI transceiver adapter (10BASE-T, thin coaxial, or thick coaxial).
- One 3.5 mm sound output port for headphones or line-level devices.

- One 3.5 mm sound input port for stereo sound input. The sound input port supports the Apple PlainTalk Microphone that comes with some Macintosh computers. The sound input port also supports a standard stereo (miniplug-to-RCA) cable adapter for connecting stereo equipment to your computer. It does not support the omnidirectional microphone (the round microphone shipped with some earlier models of Macintosh) or the attenuated RCA adapter provided with some models of Macintosh.
- One pair of RCA-type audio ports for stereo input (left and right).
- One pair of RCA-type audio ports for stereo output (left and right).
- Two video input ports that support the NTSC, PAL, and SECAM video standards.
- Two video output ports that support the NTSC and PAL video standards.
- One external SCSI interface that supports up to seven external SCSI devices, or one internal plus six external SCSI devices. An internal SCSI device can be connected to this interface by an Apple-authorized dealer or service provider.

IMPORTANT Some older SCSI devices may require updated drivers. (A "driver" is special software that is installed in your System Folder.) Contact the device manufacturer for information on obtaining driver software.

- One internal SCSI interface that supports the internal hard disk and optional CD-ROM drive. One additional SCSI device can be connected to the internal SCSI interface by an Apple-authorized dealer or service provider.

IMPORTANT The factory-installed internal hard disk is terminated. If another SCSI device is attached to the internal SCSI interface, it must not be terminated. The internal SCSI interface can contain only one terminated device; if you attach more than one terminated device to the internal SCSI interface, damage to the computer's main logic board can occur.

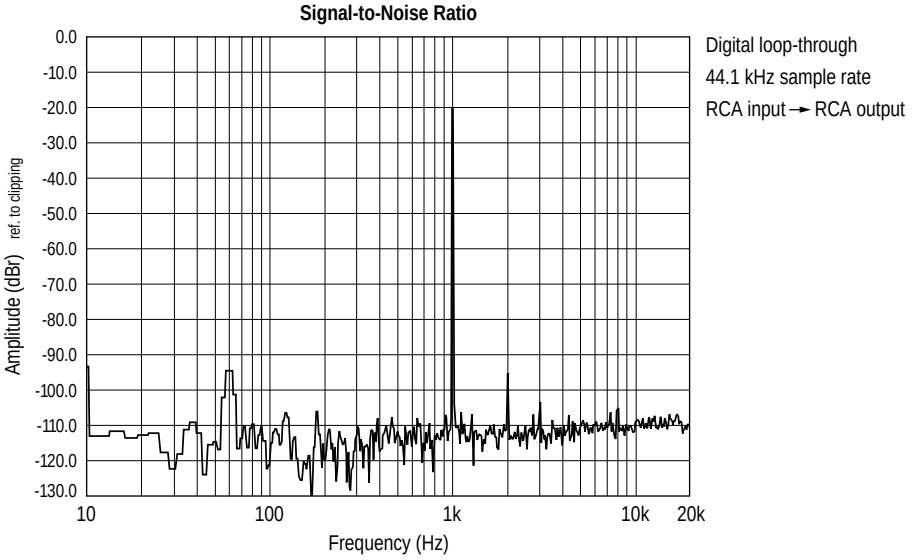
Audio system

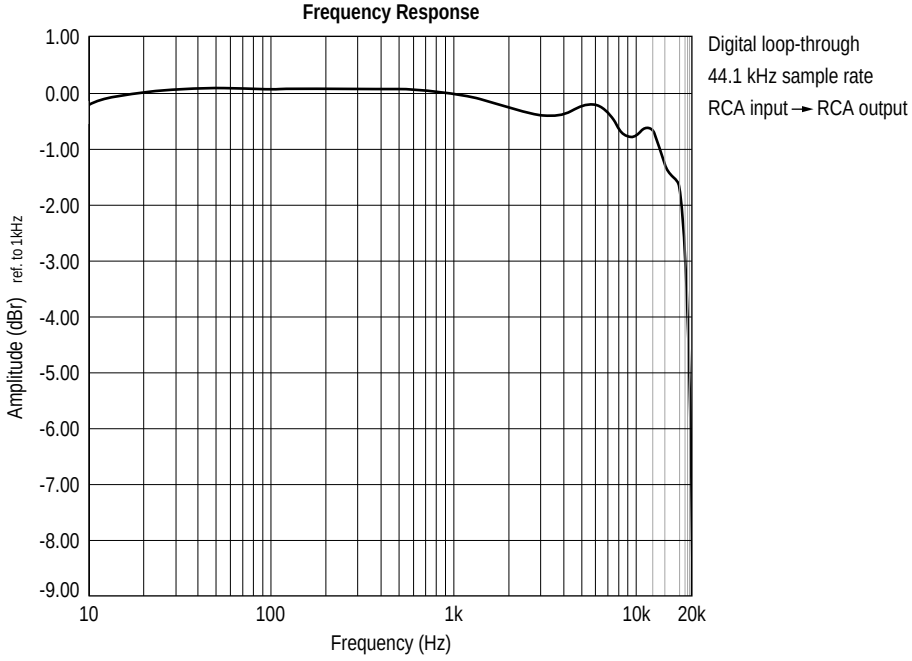
- Custom sound circuitry, including stereo generator (digital-to-analog converter, or DAC)—capable of driving stereo miniplug headphones or audio equipment—and stereo sampling hardware (analog-to-digital converter, or ADC) for recording stereo sound
- 16-bit stereo input and output
- Sample rates of 44.1 and 22.05 kilohertz (kHz)

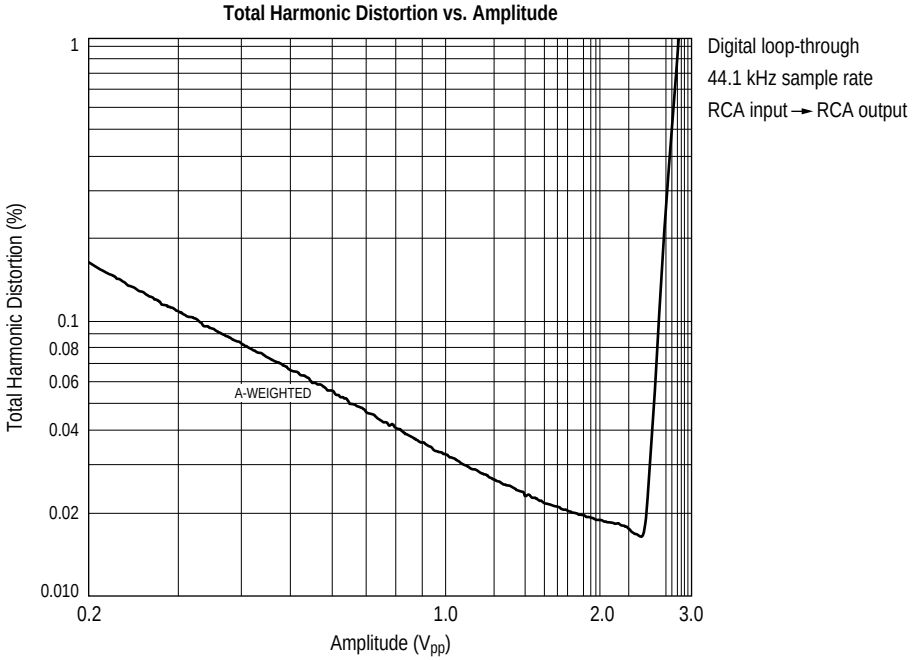
Typical specifications

- Sound input connector line level: 2.8 volts peak-to-peak (Vpp) nominal, into 3.0-kilohm (kΩ) impedance (minimum)
- RCA-type input connector line level: 2.4 Vpp nominal, into 13.5-kΩ impedance (minimum)
- Sound output connector line level: 2.7 Vpp nominal, into 32-kΩ impedance
- RCA-type output connector level: 2.9 Vpp nominal into 2-kΩ impedance (minimum)
- Sound input signal-to-noise ratio (SNR): >83 decibels (dB) A-weighted with no audible discrete tones
- RCA-type input SNR: >77 dB A-weighted with no audible discrete tones
- Sound output SNR: >84 dB A-weighted with no audible discrete tones
- RCA-type output SNR: >84 dB A-weighted with no audible discrete tones
- Bandwidth: 10 Hz to 18 kHz (+0.1 dB, –3.0 dB) at 44.1-kHz sample rate
- RCA-type input total harmonic distortion plus noise (THD + N): less than 0.018 percent A-weighted; measured 10 Hz to 30 kHz with a 2.4-Vpp sine wave input

The following graphs show typical data for the Power Macintosh 8500. (Your computer's data may vary, depending on the equipment you have connected.)







Video system

Video input

- Type: composite or S-video
- Timing: industry standard NTSC/PAL/SECAM
- Polarity: sync negative
- Level: 8 Vpp minimum to 2.0 peak-to-peak (p-p) maximum (“S” chroma level 1.4 Vpp maximum)
- Impedance: 75 ohms (Ω) internally terminated
- DC offset: +/– 1.0 volts (V) maximum

Video output

- Type: composite and S-video (both available simultaneously)
- Timing: industry standard NTSC or PAL
- Polarity: sync negative (no sync on “S” chroma signal)
- Level: 1.0 Vpp +/– 5% into a 75 Ω resistive load (“S” chroma .7 V Vpp)
- Impedance: 75 Ω source
- DC offset: +0.2 V maximum (loaded)

AC line input

- Line voltage: 100–240 V alternating current (AC), RMS single phase, automatically configured
- Frequency: 50–60 Hz
- Power: 340 watts maximum continuous; 520 watts peak input

AC line output

- Output receptacle: 100–120 V, 3 amperes (A) AC, 220–240 V, 1.5 A AC RMS (determined by actual input voltage); 3 A maximum at 100 V

DC power

- Continuous output: 225 watts

Current type	Total*
+3.3 V	20 A
+5 V	35 A
+5 V (trickle)	0.10 A
+12 V	5 A
–12 V	0.75 A

*Total power output cannot exceed 225 W.

Power requirements for devices you can connect

Apple Desktop Bus (ADB)

- Mouse draws up to 10 milliamperes (mA)
- Keyboard draws 25–80 mA (varies with keyboard model used)
- Maximum current available for all ADB devices: 500 mA

Note: The ADB port can support up to three daisy-chained ADB devices.

Audio and telecommunications devices

The following table shows power allowances for external devices connected to input ports.

Device	Voltage	Current	Power
Microphone	+5 V	20 mA	100 mW
GeoPort telecom adapter	+5 V	500 mA	2.5 W
S-video input connector	+12 V	250 mA	3 W

Expansion cards and devices

If you add an expansion card, a 5.25-inch storage device, or a 3.5-inch storage device to your Macintosh computer, make sure the component's power requirements don't exceed the maximum power allowances allocated to it by the computer.

The maximum power allowances for expansion cards in your computer can accommodate three 15-watt or two 25-watt cards. Detailed guidelines are presented in the following table.

Device	Voltage	Current	Power
Expansion card (15 watts)*	+5 V +12 V –12 V +3.3 V	3 A 0.500 A 0.100 A 2 A	15 W 6 W 1.2 W 6.6 W
Expansion card (25 watts)**	+5 V +12 V –12 V +3.3 V	5 A 0.500 A 0.100 A 2 A	25 W 6 W 1.2 W 6.6 W
Storage device (such as a CD-ROM drive)	+5 V +12 V +12 V	9 A 3 A 7.5 A peak***	45 W 36 W —

*15-watt expansion cards should not consume more than 15 watts of power total.
**25-watt cards should not consume more than 25 watts of power total.
***Peak power is for startup only and must not occur in normal operation.

Assigning SCSI ID numbers

Your computer has two SCSI chains: an internal chain and an external chain. All devices on the same SCSI chain must have unique ID numbers, but devices on different SCSI chains may use the same SCSI ID number. (For example, you could have a CD-ROM drive with ID number 3 connected to the internal SCSI chain and a tape drive with ID number 3 connected to the external SCSI chain.)

The drives that were installed in your computer at the factory, as well as the computer itself, have already reserved certain SCSI ID numbers. Other ID numbers are available for assignment to SCSI devices that are added after you buy your computer, as described in the following table.

SCSI chain	SCSI ID number	Device
Internal*	0	factory-installed hard disk
	1	available
	2	available
	3	factory-installed CD-ROM drive (optional)
	4	available
	5	available
	6	available
	7	Power Macintosh computer
External	0	available
	1	available
	2	available
	3	available
	4	available
	5	available
	6	available
	7	Power Macintosh computer

*Although 5 or 6 SCSI ID numbers are available for assignment, only one other SCSI device can be connected to the internal SCSI chain.

Size and weight

The following table shows size and weight information for your computer and mouse.

Weight	Height	Width	Depth
Main unit			
12.7 kg* 28 lb.*	355.6 mm 14 in.	196 mm 7.7 in.	400 mm 15.75 in.
Mouse			
0.11 kg 4 oz.	33 mm 1.3 in.	61 mm 2.4 in.	107 mm 4.2 in.

*Weight varies depending on type of hard disk and may be greater if a 5.25-inch device, such as a CD-ROM drive, is installed.

Environment

Operating temperature

- 10° C to 40° C (50° F to 104° F)

Storage temperature

- –40° C to 47° C (–40° F to 116.6° F)

Relative humidity

- 5 percent to 95 percent (noncondensing)

Altitude

- 0 to 3048 m (0 to 10,000 ft.)

Specifications for optional CD-ROM drive

■ Disc diameter	120 millimeters (mm) (5.25 inches) and 80 mm
■ Scanning velocity	1.2–1.4 meters per second (normal speed)
■ Rotation speed	Varies over radius
Normal speed	~530 to 230 revolutions per minute (rpm)
Double speed	~1060 to 460 rpm
Eight-times speed	~4240 to 1840 rpm
■ Latency (average)	Varies over radius
Normal speed	~55 to 130 milliseconds (ms)
Double speed	~27.5 to 65 ms
Eight-times speed	~6.88 to 16.25 ms
■ Blocks per rotation	~8.4 to 19.5 variable
■ Average access time (typical)	
Normal speed	380 ms
Double speed	270 ms
Eight-times speed	160 ms

Data

■ Data capacity	656 megabytes (MB), Mode 1 748 MB, Mode 2
■ Number of blocks per disc	336,150
■ Data per block	2048 bytes, Mode 1 2336 bytes, Mode 2
■ Address description	Minutes, seconds, blocks

Audio capacity

■ Playing time	74 minutes, 42 seconds

Modes supported

■ Audio CD	
■ CD-ROM	Modes 1 and 2
■ CD-ROM XA	Mode 2, Forms 1 and 2
■ CD-I	Mode 2, Forms 1 and 2
■ Photo CD	Single-session and multisession
■ Video CD	

Data streaming and transfer rates

■ Blocks per second	
Normal speed	75
Double speed	150
Eight-times speed	600
■ User kilobytes (K) per second	
Normal speed	150K, Mode 1
	171.1K, Mode 2
Double speed	300K, Mode 1
	342.2K, Mode 2
Eight-times speed	1200K, Mode 1
	1368.8K, Mode 2

- SCSI bus burst rate (typical)

Asynchronous	5.0 MB per second
Synchronous	5.0 MB per second

Power consumption (typical)	
+5 V DC	350 milliamperes (mA)
+12 V DC	300 mA

Laser

- Type: Semiconductor GaAlAs laser
- Wavelength: 770 to 795 nanometers
- Output power: 0.2 to 0.6 milliwatts
- Beam divergence: 55°

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